

## ASPHYXIA

•The essential substance of asphyxia is the struggle to breathe against some kind of interference with respiratory movements.

### **Characteristic features of asphyxia :**

cyanosis due to accumulation of reduced hemoglobin and an increase of CO<sub>2</sub>,  
venous congestion,  
petechial haemorrhages - in the skin, under the conjunctivae, subpleural (Tardieu spots),  
subendocardial,

Forensic medicine deals mainly with forms of mechanical interference in breathing (obstructive in nature).

### **The three phases of fatal asphyxia are as follows:**

1- hypoxia and slight cyanosis with accumulating CO<sub>2</sub>, with quick and deep breathing,  
2- venous and capillary stagnation, petechiae break out,  
3- infrequent respiratory movements, loss of consciousness, occurrence of convulsions.  
Irreversible brain damage. Death ensues.

### **Accidental and criminal forms of mechanical asphyxia:**

**suffocation** - when the nose and mouth are obstructed, e.g. closure of the nostrils and/or mouth, deliberately by gagging, accidental, e.g. in infants, in elderly

-homicidal, e.g. with a pillow,  
-suicidal, e.g. use polythene bags,  
-no findings at autopsy,

**choking** – closure of internal airways across the glottis (larynx), may be considered as a sudden death, until the autopsy reveals the true cause of death – foreign objects e.g. pieces of food, toys, denture,

- accidental, usually associated with alcohol or drug intoxication, in the elderly, due to severe CNS depression, neurology diseases,

**hanging** - death by suspension - almost always suicidal, is caused by constriction of the neck by a ligature, tightened by body weight,

-the ligature, placed loosely around the neck, becomes tightened as the body hangs,  
-typically ligature mark is found above larynx (thyro-hyoid level) in front; inverted V- shaped mark with apex indicating suspension point,

•high – point hanging – no contact between feet and ground,

- low - point hanging – with contact between body and ground – possible while sitting, kneeling and even in lying position,

- autopsy findings

- often - typical location of lividity,

- ligature mark

- Amussat's sign, Martin's sign, Simon's sign,

- hemorrhages in attachments of the muscles of the neck,

- rarely - injuries of the larynx or hyoid bone and other features of asphyxia,

### **Strangulation**

- manual strangulation – is effected by hands

- autopsy findings: face may be congested, marks of the grip and/or finger-tips and/or finger-nails can be found on the neck – linear semicircular abrasions, bruises,

- injuries of larynx, hyoid bone are often visible,

- should be assumed as homicidal until the examination proves the contrary (circumstances e.g. accidental autoerotic strangulation),

- ligature strangulation - with a ligature, that usually encircles the neck horizontally, below larynx,

- usually homicidal – ligature tightened by another hand,

- face markedly congested, conjunctivae and skin petechiae are visible, most frequent is fracture of the superior horns of the thyroid cartilage and rarely its base, if the grip is of great violence we can see fractures of hyoid bone (greater horns).

### Death mechanisms in strangulation

- obstruction in the venous return to the heart

- obstruction in the arterial blood flow to the brain – dominant mechanism – cerebral hypoxia,

- carotid arteries, vertebral arteries,

- stimulation of the vagal nerves

- occlusion of the trachea,

### **Drowning**

- aspiration of fluid-water into the lungs,

- fresh-water drowning (hypotonic) – extreme hypervolemia, hemolysis, denaturizing of pulmonary surfactant (alveoli collapse),

- salt-water drowning (hypertonic) – decreasing of blood volume, haemoconcentration, increasing of electrolyte levels, dilution or washing out of pulmonary surfactant,

•Autopsy findings at drowning:

-overdistended lungs, caused by water thrusting the residual air deep into the principal and peripheral bronchi,

-fine froth swelling up through airways out of the nostrils and/or mouth,

-washerwoman hands – skin of the hands and soles become pale, macerated, wrinkled – in living or dead person immersed in water,

-microscopic examination of inner organs, examination of alcohol intoxication,

-microscopic examination of presence of diatoms (microscopic algae present in all types of natural water) rapidly enter the circulation with water in alive victim of drowning, reaching inner organs e.g. lungs, kidneys, bone marrow.

Why do we perform the autopsy of bodies recovered from the water?

-to determine cause of death,

-to exclude other than drowning causes of death,

Bodies recovered from water may have died:

•of natural causes before entering water,

•of any unnatural death before entering the water,

•of natural causes while immersion in water – death in water,

•of injuries after entering the water,

•from true drowning.

Traumatic or crush asphyxia

Fixation of the thorax by any external pressure that prevents respiratory movements.

•seen most clearly in heavy roll crushes of the chest or pinning and crushing beneath weights,

•autopsy: all signs of asphyxia are often visible: massive congestion of the head, neck and upper part of chest (to the clavicle level), petechiae, cyanosis.

Forms of toxic ASPHYXIA

•carbon monoxide intoxication - CO is a colorless, odorless gas, slightly lighter than air, produced during incomplete burning of any carbon fuel,

•important is its great readiness to attach itself to hemoglobin,

•affinity of hemoglobin for carbon monoxide is 300 times greater than for oxygen,

•carboxyhemoglobin (COHb) is a fairly stable complex - and prevents the uptake of oxygen, usually accidental, sometimes suicidal,

•autopsy findings

- cherry – red discoloration of the lividity, blood in the body and all inner organs,
- “natural” presence of COHb in the blood stream (non-smokers vs. smokers, toxic levels)

- cyanide intoxication - kind of poison that produces cellular hypoxia, due to inhibition of cytochrome oxidase, thus preventing the transfer of the oxygen to the individual cells, usually suicidal,

- the blood of the deceased remains a cherry-pink color,

#### Forms of environmental ASPHYXIA

- death occur simply, because there is insufficient oxygen available to sustain life,

- deaths in small spaces,

- displacement of oxygen by another gas, e.g. carbon dioxide, nitrogen (silo, holds of ships, cisterns),

- autopsy asphyxial findings may be minimal.